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INKJET PRINTER
[Inkujetto purinta]

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Specification

1. Name of this Invention

INKJET PRINTER

2. Claim(s)

[1] Inkjet printer having a capping element for preventing nozzle clogging, wherein said capping element comprises a capping section for sealing the nozzle of said print head, purge section for jetting an ink from said nozzle to stabilize the granulation of the ink, spray section for spraying an ink from said nozzle for activating the nozzle, nozzle face cleaning section for cleaning said nozzle, and carriage transfer belt letting a carriage carrying said print head move without contacting the capping element, and an ink collection section is provided for collecting the ink jetted to each section formed on said capping element.

[2] Inkjet printer according to Claim 1, wherein said ink collection section is composed of an ink absorbing material contacted to said capping element for collecting the ink on the capping element in sequence.

[3] Inkjet printer according to Claim 2, wherein said ink absorbing material is disposed in a replaceable cassette container.

3. Detailed Explanation of this Invention

[Technological Field]

This invention pertains to an on-demand type inkjet printer and is particularly associated with an inkjet printer having a capping

element for preventing the clogging of print head nozzles, comprising a capping section, purge section for stabilizing the granulation of the ink, spray section for activating the nozzle, nozzle face cleaning section for cleaning said nozzle section, and carriage transfer belt, wherein these sections are integrated into a single unit and not configured as physically separated units.

[Conventional Technology and its Problems]

As shown in Fig. 1 illustrating an example of inkjet printer, a platen (not shown) is positioned opposite to a print head **2**, disposing a recording medium **1** between them, and ink is supplied to the print head **2** and jetted to a recording medium **1** from a nozzle tip (not shown). The print head **2** is mounted onto a carriage **3** and prints an applicable image (e.g., characters) by letting the carriage **3** move parallel to the platen. Moreover, the capping element **4** is attached to the print head **2** for preventing clogging and capped at a location away from the printing location as shown in the figure. The reference numeral **5** denotes a carriage transfer shaft.

The nozzle of said print head **2**, which is quite small, causes clogging by the evaporated ink solvent. Therefore, to protect the nozzle, an elastic roller used as a capping section **4** (see Fig. 2) seals the nozzle **6** by rotating the print head **2** in the direction indicated by the arrow in the figure by a drive mechanism (not shown) while the printer is idle or turned off. Also, when a print command

is issued, the print head 2 is rotated by a drive mechanism (not shown) and separated from the elastic roller.

Furthermore, in order to activate the nozzle surface of print head 2 (since some nozzles of a color printer do not need to be operated during printing), the process (of operating an electrostrictive element) identical to the printing operation is periodically performed to jet an ink to the absorption material 7 from a nozzle 6 as shown in Fig. 3 (function of spray ink collection section).

Moreover, once the ink granulation becomes unstable, as shown in Fig. 4, an ink is sprayed from a nozzle 6 using a pressure system or the like (not shown). The sprayed ink is then collected through a tube 8 arranged to have a negative pressure by a pump (not shown) (function of purge ink collection section).

The above-mentioned mechanisms are built as independent units disposed in an inkjet printer for protecting the nozzles 6 of print head 2. This results in spaces needed for positioning each individual unit, hence making the printer large in size, requiring costly manufacture.

[Object of this Invention]

The object of this invention is to solve the above-mentioned problems by providing an inkjet printer incorporating three sections functioning to protect the print head nozzles as a single unit instead of constructing as individually separated units.

[Constitution of this Invention]

To achieve the above-mentioned object, this invention provides an inkjet printer having a capping element for preventing nozzle clogging, wherein said capping element comprises a capping section for sealing the nozzle of said print head, purge section for jetting an ink from said nozzle to stabilize the granulation of the ink, spray section for spraying an ink from said nozzle for activating the nozzle, nozzle face cleaning section for cleaning said nozzle section, and carriage transfer belt letting the carriage carrying said print head move without contacting the capping element, and also, an ink collection part is provided for collecting the ink jetted to each section thereof.

[Embodiments of this Invention]

Hereafter, the embodiments of this invention will be explained in detail.

Figure 5 is a diagram illustrating an operational example of inkjet printer.

In the figure, a capping element **9** of this invention is configured of an elastic roller and contains a protruded capping section **12** for sealing a nozzle **11** of a print head **10**, a purge section **13** for jetting an ink from the nozzle **11** to stabilize the granulation of the ink, a spray section for jetting an ink from the nozzle **11** to activating the nozzle, a nozzle cleaning section **15** for cleaning up the nozzle surface as required after the actions of said

capping, purging, spraying and the like, and a carriage moving belt **17** to let the carriage **16** carrying the print head **10** move without contacting the capping member **9**. Inks jetted to sections provided in the capping member **9** are restored by an ink collection section **18**. The reference numeral **19** denotes a detector for detecting the home position of the capping element **9** so as to determine the position of each section thereof. The reference numeral **20** denotes a carriage shaft.

The capping element **9** can rotate in the direction indicated by the arrow shown in the figure by a drive mechanism (not shown). Therefore, when the print head **10** on the carriage **16** moves to the capping location while the printer is idle, the capping element **9** rotates to let the capping section **12** make a contact with the print head **10**, thus sealing the nozzle **11**. At a time of printing, the capping element **9** is rotated in the direction indicated by the arrow. Then, the purge section **13** detects the ink granulation state of the nozzle using a granulation detection sensor (not shown). If the detected result is satisfactory, since purging is unnecessary, after the nozzle **11** is cleaned by the nozzle cleaning section **15**, the capping element **9** stops its movement when the carriage transfer belt **17** is positioned to oppose the print head **10**, letting the print head **10** move to start printing. On the other hand, when the granulation state detection sensor detects an unsatisfactory granulation state of the nozzle, after the purge section **13** purges the ink, the spray

section **14** sprays ink. Then, once the granulation state detection sensor (not shown) confirms the satisfactory granulation state, the nozzle **11** is cleaned using the above-mentioned nozzle cleaning section **15**, and the carriage transfer belt **17** makes the print head **10** move to perform printing operation. Also, the above-mentioned drive control operation is made possible by providing a pulse-based control from the home position of the capping element **9** using a pulse motor or the like as the drive source for the capping element **9**.

An ink jetted from a nozzle **11** on the above-mentioned purge section **13** is collected by the purge ink collection section (the distance to the print head **10** is 0.3 - 0.5 mm in this embodiment). In addition, the ink jetted from the nozzle **11** at the spray section **14** is collected to the spray ink collection section (the dent of the spray section = 0.5 mm, distance to the print head 10 = 1 - 2 mm in this embodiment). In order to improve the recovered amount of ink, the roller surface of capping element **9** is made as hydrophilic for allowing the ink to easily adhere to the nozzle face of the print head **10**. Moreover, the capping element is rotated at a specific speed (10 sec. for a rotation according to this embodiment) suitable for the jetted ink amount, allowing the ink to attach to the nozzle surface. Then, the ink is collected by the ink collection section **18**.

The ink collection section **18** is configured of an ink absorbing material **21** contacting the capping element **9** to absorb and collect the ink sequentially (see Fig. 6). By arranging the ink absorption

material **21** to be more hydrophilic than the capping element **9**, the ink in the above-mentioned purging ink collection section, spray ink collection section, etc., can be almost completely absorbed.

Also, for easy replacement of ink absorbing material **21**, the ink absorbing material **21** is folded to increase the capacity of ink storage and disposed in a container **22** formed as a cassette, exposing only the area contacting the capping element **9**. The reference numeral **23** denotes a protrusion made of an elastic material for pressing the ink-absorbing material with an appropriate pressure when said cassette is installed.

Figure 7 is a diagram illustrating another embodiment of this invention. With this embodiment, instead of forming a capping element **9** as an elastic roller shown in Fig. 5, the capping element **9** is formed as an elastic belt **24** shown in Fig. 7, installed in the same manner. The reference numeral **25** denotes a pressure part for making the capping section (protruding part) **12** of the elastic belt **24** tightly contact the print head. The reference numeral **26** denotes a drive mechanism.

[Effect of this Invention]

As explained in detail, in addition to the function of preventing nozzle clogging, the capping element of the inkjet printer of this invention also functions to collect an ink purged for stabilizing the granulation of the ink, ink sprayed for activating the nozzle, and ink adhered to the surface during the contact between

the capping element and nozzle. Hence, the above-mentioned four functions which are conventionally formed as individual units can be integrated into one unit by rotating the capping element. Consequently, unlike the conventional inkjet printer, the print head of this invention does not need to move on the carriage shaft for operating each function, thereby allowing the elimination of spaces conventionally needed to accommodate four dedicated functions. In addition, since the ink on the capping element is immersed in the ink absorbing material and collected, the conventionally required pump mechanism or the like for collecting the ink waste is no longer needed. As a result, the printer can be made smaller by simplifying the drive mechanism and saving the space. Also, by arranging the ink collection part as a cassette device, the ink absorbing material can be easily replaced.

4. Simple Explanation of Figures

Figure 1 is a diagram explaining the conventional inkjet printer. Figures 2 - 4 show the side faces of capping system, spray system, and purging system of the conventional inkjet printer. Figure 5 is a diagram illustrating the inkjet printer of the embodiment of this invention. Figure 6 is a diagram illustrating the ink collection section of this invention. Figure 7 is a diagram illustrating another embodiment of this invention.

In the figures: 9…Capping element; 10…Print head; 11…Nozzle; 12…Capping section; 13….Purging section; 14…Spray section; 15…Nozzle

cleaning section; 16...Carriage; 17...Carriage moving band; 18...Oink collection section; 19...Detector; 20...Carriage shaft; 21...Ink absorbing material; 22...Container; 23...Elastic protrusion; 24...Elastic belt; 25...Pressure part; 26...Drive part

Figure 1

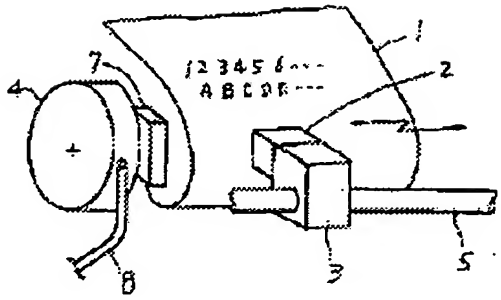


Figure 2

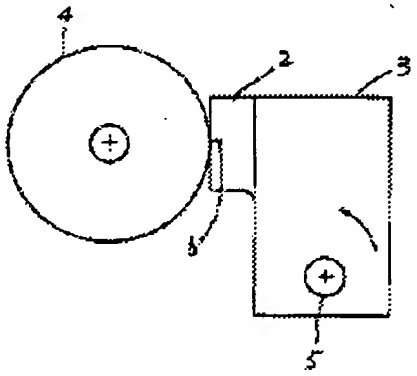
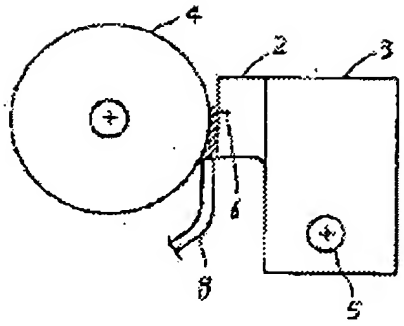


Figure 4

Figure 3



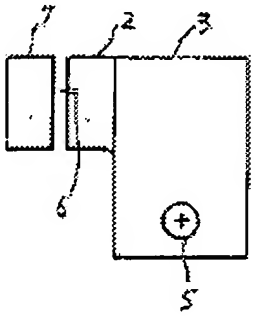


Figure 5

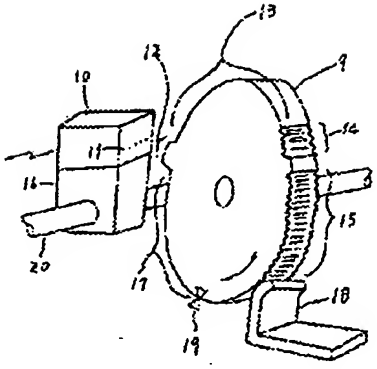


Figure 6

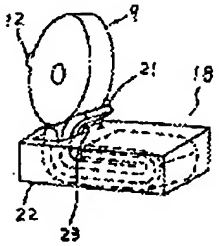


Figure 7